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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/821,478	03/29/2001	Hung Yip Ng	FIS9-2000-0192	5481

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EXAMINER
SAGAR, KRIPA

ART UNIT	PAPER NUMBER
1756	6

DATE MAILED: 08/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/821,478	Applicant(s) NG, HUNG YIP	
	Examin r Kripa Sagar	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 June 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 1,7 are rejected under 35 U.S.C. 102(e) as being anticipated by US Pat. 6174818 to Tao et al.

The invention discloses a method of trimming structures on semiconductor (SC) devices by plasma etching.

The claim recites providing a structure with a first critical dimension (CD) and lithographically reducing the CD with an O2-containing trimming etch.

Tao teaches a method of narrowing gate electrodes on a device. The steps comprise (a) forming a stack layer and patterning the photoresist, (b) optionally

trimming the resist pattern (c) etching the anti-reflection coating (ARC) and hardmask and trimming the hard mask to a sub-lithographic dimension (if not trimmed by the photoresist) and (d) etching the gate to the desired sub-lithographic dimension. These are shown in Figs. 2-6. Tao uses an O2-containing gas in the plasma etching process (3;43-52).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao as applied to claim 1 above in view of US Pat. 5783101 to Ma et al.

The instant claims recite (a) correcting the CD-bias between nested and isolated features during a plasma etch and (b) the etching parameters for the process.

The teachings of Tao have been discussed above. It does not teach correcting for the CD-bias, the magnitude of the correction or the etching parameters used. It does not specify positive or negative resists.

Ma teaches that CD-bias or "profile microloading" is known in prior art (1;60-2;21). The prior-art process corrects for the microloading effect by adjusting the RF power (and hence the space charge). Note that the resist sputtering effect is also adjustable by adjusting the frequency of the RF power (2;32-64). Ma's invention discloses further adjusting the etch parameters to correct for the CD bias. These include

lowering the frequency (Fig.5) and increasing the RF power (3;10-27). The system is operated at 0-100mT (5;45-49).

Ma does not specify positive or negative photoresists (claims 2,4) or the extent of lateral trimming (claim 5) by the etch. The choice of the photoresist and the adjustment of the trim are uniquely determined by the process. These are based on empirical data and process control techniques instituted on the manufacturing line.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Ma to set the etching parameters in a trimming process taught by Tao such that the nested and isolated features on a device are trimmed to compensate for the CD-bias; because Ma teaches that varying the above mentioned parameters reduces microloading and increases the process window (3;15-27).

6. Claims 8-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tao in view of Ma.

The instant claims recite providing a structure with a first critical dimension (CD) and lithographically reducing the CD by an O2-containing trimming etch. The claims further recite correcting the CD-bias between nested and isolated features during a plasma etch and the etching parameters for the process.

Tao teaches a method of narrowing gate electrodes on a device. The steps comprise (a) forming a stack layer and patterning the photoresist, (b) optionally trimming the resist pattern (c) etching the anti-reflection coating and hardmask and trimming the hard mask to a sub-lithographic dimension (if not trimmed by the photoresist) and (d) etching

the gate to the desired sub-lithographic dimension. These are shown in Figs. 2-6. Tao uses an O2-containing gas in the plasma etching process (3;43-52). Tao discloses that the use of NF3 as an etchant species is known in prior art(1;52-58)

The teachings of Tao have been discussed above. It does not teach correcting for the CD-bias, the magnitude of the correction or the etching parameters used. It does not specify positive or negative resists. Tao's layers include an oxide layer and an ARC but do not contain TEOS.

Ma teaches that CD-bias or "profile microloading" is known in prior art (1;60-2;21). The prior-art process corrects for the microloading effect by adjusting the RF power (and hence the space charge). Note that the resist sputtering effect is also adjustable by adjusting the frequency of the RF power (2;32-64). Ma's invention discloses further adjusting the etch parameters to correct for the CD bias. These include lowering the frequency (Fig.5) and increasing the RF power (3;10-27). The system is operated at 0-100mT (5;45-49).

Ma does not specify positive or negative photoresists (claims 2,4) or the extent of lateral trimming (claim 5) by the etch. The choice of the photoresist and the adjustment of the trim are uniquely determined by the process. These are based on empirical data and process control techniques instituted on the manufacturing line. Ma's layers do not include TEOS which is a well known material used in the art as a dielectric layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Ma to set the etching parameters in a trimming process taught by Tao such that the nested and isolated features on a device

are trimmed to compensate for the CD-bias; because Ma teaches that varying the above mentioned parameters reduces microloading and increases the process window (3;15-27).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on 8:00AM--5:00PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks
August 9, 2002

MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700